

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 31 MAR 2006

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Applicant's or agent's file reference		<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/EP2004/012747		International filing date (day/month/year) 09.11.2004	Priority date (day/month/year) 16.12.2003	
International Patent Classification (IPC) or national classification and IPC INV. B01J19/00 B01L3/00 B01F13/00				
Applicant UNILEVER PLC				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  21.06.2005		Date of completion of this report  30.03.2006		
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer  Vlassis, M  Telephone No. +31 70 340-4292		



# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/EP2004/012747

## Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

### Description, Pages

1, 3-17 as originally filed  
2 received on 01.07.2005 with letter of 28.06.2005

### Claims, Numbers

1-12 received on 01.07.2005 with letter of 28.06.2005

### Drawings, Sheets

1/1 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing *(specify)*:
    - ☐ any table(s) related to sequence listing *(specify)*:
  4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing *(specify)*:
    - ☐ any table(s) related to sequence listing *(specify)*:

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/012747

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	7-12
	No: Claims	1-6
Inventive step (IS)	Yes: Claims	7-12
	No: Claims	1-6
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

- 1) The amendments filed by the applicant with letter dated 28/6/2005 are considered to comply with the requirements of Art. 34(2)(b) PCT.
- 2) The claims 1-12 are considered unclear (Art.6 PCT) for the reasons set out under Item VIII. Furthermore, the above-mentioned lack of clarity notwithstanding, the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT, and therefore the criteria of Article 33(1) PCT are not met.

Given the lack of clarity of claim 1 mentioned under Item VIII, a direct comparison with the prior art is not possible, since in present claim 1 it is not clear which part of the flow resistance provided by the channels is due to channels having different dimensions and which is due to the influence of the viscosity changes. All documents D1-D4 appear to disclose microfluidic systems which when passing the same fluids through all channels fulfill the condition of providing flow resistance of each of the upstream channels larger than the downstream channels, for the reasons explained in detail below.

Therefore, the novelty and inventive step objections for the apparatus claims are maintained.

It should be further noted, that the amendment of "liquid supply sources" does not introduce an additional technical feature to claim 1, since the supply sources should now be suitable for supplying a liquid. All supply sources in documents D1-D4 are considered to be suitable for supplying liquids.

D1 discloses a microfluidic system comprising first and second fluid supply sources (for fluids A and B respectively), for supplying first and second microfluidic reactors (see in fig.6 the intersections marked with 606 which are seen as "reactors" in the spirit of definition of the present application) via upstream channels (see reference numbers 222 and 224 in fig.2a), the reactors each having downstream channels (see 112 and 114 in fig.1 or 320 in fig.3, 610,612,614 in fig.6). The channel length  $L_2$  and channel width  $b$  of the inlet channels are smaller than the ones of the exit channels for all the reactors. Although not explicitly disclosed in D1, for mixing fluids of substantially same viscosity (like

water/water mixtures mentioned in D1) and assuming that the whole microfluidic system is made of the same material, the flow resistance of all the upstream channels of the reactors is higher than the flow resistance in the downstream channels.

Therefore, the subject-matter of claim 1 as far as it could be understood, is not novel in view of D1 (Art.33(2)PCT).

D2 discloses a microfluidic system comprising first and second fluid supply sources (for two immiscible fluids), for supplying first and second microfluidic reactors (see fig. 13). In the figures of D2 "reactors" in the spirit of definition of the present application are seen in the intersections where the two fluids meet. The fluids are supplied to the reactors via upstream channels (see reference numbers 11 and 12 in fig.1 and 2, 33 and 31 in fig.4 etc), the reactors each having a downstream channel (see 16 in fig.1-4 and 210 in fig.13). From the disclosure of D2 it appears that the length of the channel 16 in fig.1 and the equivalents thereof in the other figures, is about 500 microns (see page 11, line 16). The cross-sectional area of said channel is much larger than the cross-sectional area of each of the inlet channels. The length of the inlet channels is not disclosed but from the figures it appears that it is of the same order of magnitude as the interface channel. It appears thus, that upon use of such a system with fluids of the same viscosities, the downstream channel would have a lower flow resistance than the upstream channels.

Thus, it appears that the disclosure of D2 anticipates novelty of claim 1.

Regarding D3, for example fig.1, the reactors RR2 and RR4 appear to be supplied with reactants from a first and a second source (air and H<sub>2</sub>/CO) through upstream channels which are much longer than the downstream channels, thus the upstream channels appear to have higher flow resistance than the downstream channels (all channels assumably having the same cross-section). Additionally, the flow channels are equipped with flow valves for the flow rate regulation. Therefore, the disclosure of D3 appears similarly to fall under the present breadth of claim 1.

The microfluidic device of fig.4 in D4 (see page 25, second paragraph 26, last line), especially from the point where the split up flows start to combine, appears similarly to fall under the present breadth of claim 1.

3) Furthermore, D1 suggests the possibility of providing a plurality of such systems (see page 13, lines 18 and 19) and its applicability in case of fluids of different viscosities (see page 15, lines 12-23). Therefore, the subject-matter of claims 2,3 does not appear to involve an inventive step (Art.33(3)PCT).

4) Claim 7, provided that it would be amended as to contain the features considered as essential (see Item VIII), appears to be novel and inventive over the cited prior art, because none of the documents D1-D4 discloses a process for preparing a two phase composition, using a microfluidic system as described in the claim.

It should however be noted, that further unclarities are present in said claim:

- the upstream channels becomes a continuous phase
- one upstream channel becomes the dispersed phase in a downstream channel, since it seems highly unlikely, that a channel becomes a phase.

The same applies for claims 8-12 depending directly or indirectly on claim 7.

#### **Item VIII**

1) The application does not meet the requirements of Article 6 PCT, because claims 1-12 are unclear.

a) The applicant, in his letter dated 28/6/2005 argues that the part "the resistance...channels" of claim 1 is "as precise as the invention allows because...the technical feature of the difference in resistance of the channels can be achieved in a number of ways and to limit the claims to one particular means of realizing the feature would unduly limit the scope of the claim" and in his opinion "... [on] page 2, lines 13 and 14 ... it is stated that "the dimension of the channel generally characterizes the fluid resistance".

However, the application is dealing with mixing/ reacting of fluids which can be of different viscosity (see also claim 12) and the viscosities in the upstream and downstream channels varies significantly and thus cannot be assumed to stay constant or being negligible when calculating the resistance in each channel (see also equation mentioned on page 2 of the description).

Furthermore, under this aspect, it is not clear from the present wording of claim 1, which upstream channel's resistance is compared with the resistance of the downstream channel, in the case wherein the upstream channels are used to transport fluids of differing viscosities.

Therefore, claim 1 does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not defined. The claim, especially the part "the resistance...channels", attempts to define the subject-matter in terms of the result to be achieved without providing the technical features necessary for achieving this result.

From the description on pages 2 and 3 as well as page 9, lines 26-29, it appears that said result can be achieved through various ways, such as for example adjusting the viscosities of the fluids, the diameters and/or the lengths of the channels.

Since such features can be features of an apparatus or features of a process, the category of the claim and thus the intended limitation as to the scope of protection of said claim is not clear.

b) In present claim 7, the feature that "the resistance of each of its upstream channels is at least **10 times** larger than the resistance of the downstream channel or channels" is not included. It appears that said feature is essential to the definition of the invention.

Since independent claim 7 does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

The same appears to apply for the first and second supply sources which are still "fluid" supply sources in claim 7.

The objections made under paragraph a) apply mutatis mutandis for claim 7 as well.

c) From the present wording of claims 1 and 7 it is not clear whether the first and second liquids which are said to be supplied to first and second microfluidic reactors are supplied via "an upstream channel" thus one upstream channel or as the subsequent expression

"each of its upstream channels" suggests more than one upstream channels and thus whether the liquids mix/ react before entering the reactors or inside the reactors.

2) It is presently unclear if on page 2, last paragraph, further reference to "diameter" is intended to mean "radius".

3) Claims 2-6 and 8-12 are rendered unclear since claims 1 and 7 do not fulfill the requirements of Art.6 PCT.